

Amendments to the Claims:

This listing of claims replaces all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (currently amended) A method for monitoring perceived quality of a packet-switched voice service in a network, ~~the method~~ comprising:

receiving a packetized voice communication via the packet-switched voice service;

obtaining at least one objective measurement from the received packetized voice communication;

deriving a user perceived quality of voice data ~~from~~ based on the at least one objective measurement; and

providing the user perceived quality of voice data,
where the receiving, obtaining, deriving, and providing are being performed in substantially real-time.

2. (currently amended) The method of claim 1, further comprising:

providing an N dimensional reference matrix that mathematically models likely user perception of acceptable quality of voice service, the reference matrix being derived from a plurality of objective voice measurements known to affect user perception of voice quality, ~~wherein~~ where N is greater than or equal to two;

obtaining a plurality of test measurements for each call placed over the packet-switched voice service;

creating a test matrix from the plurality of test measurements; and

processing the test matrix, in real-time, to determine the quality of voice data over the packet-switched voice service, the quality of service being determined by comparing the reference matrix to the test matrix.

3. (currently amended) The method of claim 2, further comprising ~~the step of~~:
generating at least one alarm in response to the ~~step of~~ processing the test matrix,
the alarm being generated if the quality of voice over the packet-switched voice service is
below a predetermined level.
4. (currently amended) The method of claim 3, further comprising ~~the step of~~ displaying
the at least one alarm in near real time.
5. (currently amended) The method of claim 4, ~~wherein the step of~~ where displaying the
at least one alarm in near real time further comprises:
displaying a human readable description of the at least one alarm; ~~and~~
displaying a cumulative distribution function (CDF) matrix, the CDF matrix
being derived from the test data matrix; and
displaying at least one indicator of likely user perception of the quality of voice
carried over the packet-switched voice service.
6. (currently amended) The method of claim 5, ~~wherein~~ where the human readable
description includes an origin/destination pair associated with the test data matrix, and a
date and time associated with the creation of the test data matrix.
7. (currently amended) The method of claim 2, ~~wherein the step of~~ where providing the
N dimensional reference matrix further comprises:
measuring the plurality of objective voice characteristics over a packet-switched
voice service to obtain sample measurements;
post-processing the sample measurements to produce stable estimates of
perceived voice quality; and
creating the reference matrix from the post-processed performance data.

8. (currently amended) The method of claim 2, ~~wherein the step of~~ where processing the test matrix to determine the quality of voice data over the packet-switched voice service further ~~comprise the step of~~ comprises :

creating a reference pattern matrix, the reference pattern matrix embodying a comparison of the test data matrix and the reference matrix.

9. (currently amended) The method of claim 8, ~~wherein the step of~~ where processing the test matrix to determine the quality of voice data over the packet-switched voice service further comprises:

creating a cumulative matrix, the cumulative matrix being created by summing each row in the test matrix, step-by-step, such that each element in the row is a sum of all preceding elements.

10. (currently amended) The method of claim 9, ~~wherein the step of~~ where processing the test matrix to determine the quality of voice data over the packet-switched voice service ~~includes the step of~~ further comprises:

deriving a cumulative distribution function (CDF) matrix ~~from~~ based on the cumulative matrix, the CDF matrix being created by dividing each element in each row of the cumulative matrix by ~~[[the]]~~ a largest value in each row of the cumulative matrix.

11. (currently amended) The method of claim 10, ~~wherein the step of~~ where processing the test matrix to determine the quality of voice data over the packet-switched voice service ~~includes the step of~~ further comprises:

comparing each element of the CDF matrix with each corresponding element of the reference matrix to create ~~[[a]]~~ the reference pattern matrix.

12. (currently amended) The method of claim 11, ~~wherein~~ where an element of the reference pattern matrix is populated with a zero value when either a corresponding value of the CDF matrix is zero, or if the corresponding value of the CDF matrix is greater than a predetermined value.

13. (currently amended) The method of claim 11, ~~wherein~~ where an element of the reference pattern matrix is populated with a value of one (1) if the corresponding value of the CDF matrix is less than a predetermined value.

14. (currently amended) The method of claim 2, ~~wherein the step of~~ where processing the test matrix to determine the quality of voice data over the packet-switched voice service further comprises:

computing a mean opinion score (MOS) corresponding to a subjective user evaluation of the quality of voice over the packet-switched voice service.

15. (currently amended) The method of claim 14, ~~wherein the step of~~ where processing the test matrix to determine the quality of voice data over the packet-switched voice service further comprises: ~~the step of~~

computing a percentage of calls users would find unusable, difficult, or irritating P(UDI), the P(UDI) corresponding to a subjective user evaluation of the quality of voice over the packet-switched voice service.

16. (currently amended) The method of claim 2, further comprising:

~~the step of~~ storing the test data matrix and associated data created during the ~~step~~ of processing.

17. (currently amended) The method of claim 2, further comprising: ~~the step of~~

defining a data structure for collecting and archiving annotated test data matrices.

18. (currently amended) The method of claim 17, ~~wherein~~ where the data structure includes an identification of the packet-switched voice service associated with a test data matrix, data corresponding to the test data matrix, and a time and a date the test data matrix was created.

19. (currently amended) The method of claim 2, ~~wherein~~ where the plurality of test measurements include measurements of the plurality of objective voice characteristics.

20. (currently amended) The method of claim 19, ~~wherein~~ where the plurality of test measurements include measurements of a dropped packet rate (DPR) and round trip packet latency (RTL).

21. (currently amended) The method of claim 1, ~~wherein the step of~~ where obtaining the at least one objective measurement from the received packetized voice communication, further comprises: includes the step of

obtaining at least one objective measurement of a reconstituted digital representation of the received packetized voice communication, the reconstituted digital representation being obtained from a receiver codec.

22. (currently amended) The method of claim 21, ~~wherein~~ where the at least one objective measurement includes determining differences among successive samples in the reconstituted digital representation.

23. (currently amended) The method of claim 22, ~~wherein the step of~~ where providing the user perceived quality of voice data further comprises: includes the step of

transmitting the user perceived quality of voice data to a quality indicator disposed in a user transceiver set.

24. (currently amended) The method of claim 22, ~~wherein the step of~~ where providing the user perceived quality of voice data further comprises: includes the step of

transmitting the user perceived quality of voice data to a network management system.

25. (currently amended) The method of claim 22, ~~wherein the step of~~ where providing the user perceived quality of voice data further comprises: includes the step of

providing a raw distortion measurement.

26. (currently amended) The method of claim 22, ~~wherein the step of~~ where providing the user perceived quality of voice data further comprises: ~~includes the step of~~ providing a normalized score corresponding to the distortion measurement.

27. (currently amended) The method of claim 22, ~~wherein the step of~~ where providing the user perceived quality of voice data further comprises: ~~includes the step of~~ determining a kurtosis value of a distribution of the differences.

28. (currently amended) A system for monitoring ~~[[the]]~~ a quality of a packet-switched voice service in a network, ~~the system~~ comprising:

a memory element configured to store an N dimensional reference matrix that mathematically models likely user perception of acceptable quality of voice service, the reference matrix being derived from a plurality of objective voice measurements known to affect user perception of voice quality, ~~wherein~~ where N is greater than or equal to two;

a measurement probe configured to obtain a plurality of test measurements for each call placed over the packet-switched voice service; and

a computer coupled to the memory element and the measurement probe, the computer being ~~programmed~~ configured to,

derive a test matrix from the plurality of test measurements, and
process the test matrix, in near real time, to determine the quality of voice over the packet-switched voice service, the quality of service being determined by comparing the reference matrix to the test matrix.

29. (original) The system of claim 28, further comprising a network maintenance system coupled to the computer, the network maintenance facility being configured to generate at least one alarm in response to an input received from the computer, the alarm being

generated if the quality of voice over the packet-switched voice service is determined to be below a predetermined level.

30. (currently amended) The system of claim 29, ~~wherein~~ where the network maintenance system further comprises at least one display, the at least one display being configured to display the at least one alarm in near real time.

31. (currently amended) The system of claim 29, further comprising a graphical user interface including a display and a selection device, the graphical user interface being configured to ~~perform a method for displaying alarms on the display, the method including:~~

~~displaying~~ display a human readable description of the at least one alarm in near real time;

~~displaying~~ display a cumulative distribution function (CDF) matrix, the CDF matrix being derived from the test data matrix; and

~~displaying~~ display at least one indicator of likely user perception of the quality of voice carried over the packet-switched voice service.

32. (currently amended) The system of claim 31, ~~wherein~~ where the human readable description includes an origin/destination pair associated with the test data matrix, and a date and time associated with the creation of the test data matrix.

33. (currently amended) The system of claim 28, ~~wherein~~ where the computer is further ~~programmed~~ configured to create a reference pattern matrix, the reference pattern matrix embodying a comparison of the test data matrix and the reference matrix.

34. (currently amended) The system of claim 33, ~~wherein~~ where the computer is further ~~programmed~~ configured to create a cumulative matrix, the cumulative matrix being created by summing each row, step-by-step, such that each element in the row is a sum of all preceding elements.

35. (currently amended) The system of claim 34, ~~wherein~~ where the computer is further ~~programmed~~ configured to derive a cumulative distribution function (CDF) matrix from the cumulative matrix, the CDF matrix being created by dividing each element in each row of the cumulative matrix by ~~[[the]]~~ a largest value in each row of the cumulative matrix.

36. (currently amended) The system of claim 35, ~~wherein~~ where the computer is further ~~programmed~~ configured to compare each element of the CDF matrix with each corresponding element of the reference matrix to create a reference pattern matrix.

37. (currently amended) The system of claim 36, ~~wherein~~ where an element of the reference pattern matrix is populated with a zero value when either a corresponding value of the CDF matrix is zero, or if the corresponding value of the CDF matrix is greater than a predetermined value.

38. (currently amended) The system of claim 36, ~~wherein~~ where an element of the reference pattern matrix is populated with a value of one (1) if the corresponding value of the CDF matrix is less than a predetermined value.

39. (currently amended) The system of claim 28, ~~wherein~~ where the computer is further ~~programmed~~ configured to compute a mean opinion score (MOS) corresponding to a subjective user evaluation of the quality of voice over the packet-switched voice service.

40. (currently amended) The system of claim 28, ~~wherein~~ where the computer is further ~~programmed~~ configured to compute a percentage of calls users would find unusable, difficult, or irritating P(UDI), the P(UDI) corresponding to a subjective user evaluation of the quality of voice over the packet-switched voice service.

41. (currently amended) The system of claim 28, ~~wherein~~ where the computer is further ~~programmed~~ configured to store the test data matrix and associated data created ~~during~~ the step of processing when the computer processes the test matrix.

42. (currently amended) The system of claim 28, ~~wherein~~ where the computer is further ~~programmed~~ configured to collect and archive annotated test data matrices in a data structure.

43. (currently amended) The system of claim 42, ~~wherein~~ where the data structure includes an identification of the packet-switched voice service associated with a test data matrix, data corresponding to the test data matrix, and a time and a date the test data matrix was created.

44. (original) The system of claim 28, further comprising a data base configured to store reference matrices, test measurements, and/or test matrices.

45. (currently amended) ~~In a computer system having a graphical user interface including a display and a selection device, a method for monitoring the quality of a packet-switched voice service, the method comprising~~ The system of claim 29, where the network maintenance facility is further configured to:

~~receiving an alarm signal from the computer system, the alarm signal being generated in response to determining that the quality of voice over the packet-switched voice service is below a predetermined level;~~

~~displaying display a message in response to receiving generating the alarm signal;~~
~~selecting receive a selection of an amplifying display icon with the by a selection device;~~

~~displaying display a human readable description of the alarm signal in response to the step of selecting selection; and~~

~~displaying display at least one indicator of likely user perception of the quality of voice carried over the packet-switched voice service.~~

46. (currently amended) The ~~method~~ system of claim 45, wherein the at least one indicator includes a mean opinion score (MOS).

47. (currently amended) The ~~method~~ system of claim 45, ~~wherein~~ where the at least one indicator includes a percentage of calls users would find unusable, difficult, or irritating P(UDI), the P(UDI) corresponding to a subjective user evaluation of the quality of voice over the packet-switched voice service.

48. (currently amended) The ~~method~~ system of claim 45, ~~wherein~~ where the at least one indicator includes a distortion indicator.

49. (original) A system for monitoring the quality of a packet-switched voice service in a network, the system comprising:

a measurement device configured to obtain at least one objective measurement from a packetized voice communication, the at least one objective measurement being obtained in real-time;

a processor coupled to the measurement device, the processor being configured to derive user perceived quality of voice data from the at least one objective measurement and provide the user perceived quality of voice data in real-time.

50. (currently amended) A method for monitoring perceived quality of a packet-switched voice service in a network, the method comprising:

providing an N dimensional reference matrix that mathematically models likely user perception of acceptable quality of voice service, the reference matrix being derived from a plurality of objective voice measurements known to affect user perception of voice quality, ~~wherein~~ where N is greater than or equal to two;

obtaining a plurality of test measurements for each call placed over the packet-switched voice service;

creating a test matrix from the plurality of test measurements; and

processing the test matrix, in near real time, to determine the quality of voice data over the packet-switched voice service, the quality of service being determined by comparing the reference matrix to the test matrix.